

**RECEIVED**

DEC 07 2007

**PUBLIC SERVICE  
COMMISSION**

**COMMONWEALTH OF KENTUCKY**

**BEFORE THE**

**PUBLIC SERVICE COMMISSION OF KENTUCKY**

**IN THE MATTER OF**

**AN INVESTIGATION OF THE ENERGY AND )  
REGULATORY ISSUES IN SECTION 50 OF ) ADMINISTRATIVE  
KENTUCKY'S 2007 ENERGY ACT ) CASE NO. 2007-00477**

**KENTUCKY POWER COMPANY**

**RESPONSE TO COMMISSION STAFF'S FIRST SET OF DATA REQUESTS  
NUMBER 3**

**December 7, 2007**



**KPSC Administrative Case No. 2007-00477 An Investigation of the Energy  
and Regulatory Issues in Section 50 of KY's 2007 Energy Act  
Commission Staff's First Set of Data Requests  
Order Dated November 20, 2007  
Item No. 3  
Page 1 of 1**

**Kentucky Power Company**

**REQUEST**

Provide copies of any internal reports or utility-commissioned studies on renewable capabilities in Kentucky, including capacity for development of integrated gasification combined cycle facilities.

**RESPONSE**

Confidential treatment in the form a Petition for Confidentiality is being sought for Attachment A and Attachment E.

Attachment A contains four preliminary high level economic screening studies of Biomass at Big Sandy Plant. The four studies include: (1) biomass co-firing (via co-milling) at Big Sandy 1; (2) biomass co-firing (via co-milling) at Big Sandy 2; (3) biomass separate injection at Big Sandy 1 and (4) biomass separate injection at Big Sandy 2. Attachment A, pages 2 through 5 contain the four studies performed in 2005 and pages 6 through 13 contain the same four studies but were updated in 2006. The biomass information is a high level economic screen, taking into account only limited performance and costs. Data varies from year to year based upon updated information and revisions to the spreadsheets. In addition no biomass resource analysis around Big Sandy Plant has been conducted at the present time so no conclusions can be drawn as to the adequacy of biomass resources in sufficient quantities to co-fire. In addition the analysis does not consider the physical limitations at Big Sandy for co-firing.

Attachment B is the initial landfill gas evaluations for the Commonwealth of Kentucky.

Attachment C is the landfill gas evaluations in Kentucky Power Company's service territory.

Attachment D is a copy of the PJM interconnection study relative to KY IGCC facilities. Pertaining to the development of an IGCC facility in Kentucky, AEP performed preliminary screening studies on siting an IGCC facility in West Virginia, Ohio and Kentucky in 2005. These screening studies entailed a site selection study, and a transmission impact study by PJM. No further work was performed on a site in Kentucky after these studies were completed in 2006.

Attachment E is a copy of the IGCC plant siting study performed by Sargent & Lundy which included sites in Kentucky. As stated in the Company's Petition for Confidential Treatment, Kentucky Power is providing those portions of the study that relate to Kentucky or that are necessary to understand the Kentucky-related sections.

**WITNESS:** Timothy C Mosher/Errol K Wagner





Plant or Unit =	Biomas High	= Altemia Fuel
Separate Injection	Biomas High	= Altemia Fuel
Input Parameters		
2008 Avoided Costs:		
2010 Avoided Capacity Fixed O&M (\$/kW-year)	100.14	
2010 New Transmission Cost (\$/MW)	2.00	
O&M & Trans. Esc. (%)	14.2	
Generation Esc. (%)	15.7	
Project Dar	14.2	
Project Life (years)	15.7	
Transmission Charge Rate (%)	14.2	
Dispatch Rate (%)	14.2	
SO2 Emission Rate (mmbtu)	9.0	
Biomas SO2 Emission Rate (mmbtu)	1.0	
NOx Emission Rate (mmbtu)	1.0	
CO2 Emission Change (i.e., zero if no CO2 change due to co-firing)	0	
Fixed Costs		
Project Cost		
Original		
New Capacity		
Factor		
Generation		
Capacity		
Variable O&M (\$/MWh)	2.06	
Fixed O&M (\$ million/yr)	0.10	
Capital Cost (\$/kW of biomass)	100.14	
Heat Rate (MMBtu/MWh)	4.034	
Co-fired Heat Rate Btu/MWhr =	4.034	
Annual Heat Input, mmbtu =	18,123,283.1	
Biomas + Coal Heating Value, Btu/b =	10,875	
Biomas Bls Rate =	1,248,893.43	
Biomas Heat Input, mmbtu =	1,814	
Unit Annual Average Capacity, MW	260	
Biomass Generation, MW-hr =	109,310.8	
Total Annual Cost		
Variable Costs at Stated Capacity Factor		
Total		
CO2		
NOx		
SO2		
Var Cost		
Total		
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Allowance Prices, \$/ton		
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REDACTED

PV Factors	REC Price	Emissions Reductions and Biomass Burned, tons per year				Biomass
		SO2	NOx	CO2	Hg intensity	
	\$ / emitted MWh	tons reduced	tons reduced	tons reduced	tons reduced	tons burned
0.9172	38.77	-104.85	0.00	-13,302.28	-0.00033	20,843.12
0.9412	39.74	-105.36	0.00	-13,379.20	-0.00076	25,718.67
0.915	41.75	-116.61	0.00	-14,495.24	-0.00079	24,423.03
0.6480	42.79	-111.16	0.00	-13,872.46	-0.00072	23,181.11
0.9553	43.88	-118.13	0.00	-14,420.09	-0.00079	23,842.76
0.9066	46.08	-109.20	0.00	-13,368.81	-0.00068	23,084.72
0.4593	47.24	-113.96	0.00	-14,162.48	-0.00068	21,167.91
0.4212	48.42	-108.72	0.00	-13,369.81	-0.00068	22,773.34
0.3544	50.67	-107.71	0.00	-14,959.47	-0.00073	23,095.69
0.3250	52.14	-89.71	0.00	-8,177.25	-0.00030	9,019.15
0.2981	52.44	0.00	0.00	0.00	0.00000	0.00
0.2628	56.15	0.00	0.00	0.00	0.00000	0.00
0.2300	57.55	0.00	0.00	0.00	0.00000	0.00
0.2109	58.69	0.00	0.00	0.00	0.00000	0.00
0.1725	61.98	0.00	0.00	0.00	0.00000	0.00
0.1628	63.53	0.00	0.00	0.00	0.00000	0.00
0.1469	65.11	0.00	0.00	0.00	0.00000	0.00
0.1226	68.41	0.00	0.00	0.00	0.00000	0.00
0.1152	70.12	0.00	0.00	0.00	0.00000	0.00
0.0900	71.87	0.00	0.00	0.00	0.00000	0.00
0.0600	73.51	0.00	0.00	0.00	0.00000	0.00
0.0000	77.40	0.00	0.00	0.00	0.00000	0.00
0.0000	78.35	0.00	0.00	0.00	0.00000	0.00
0.0000	83.35	0.00	0.00	0.00	0.00000	0.00
0.0000	85.44	0.00	0.00	0.00	0.00000	0.00
0.0000	87.97	0.00	0.00	0.00	0.00000	0.00
0.0000	92.00	0.00	0.00	0.00	0.00000	0.00
0.0000	94.30	0.00	0.00	0.00	0.00000	0.00
0.0000	95.08	0.00	0.00	0.00	0.00000	0.00
0.0000	101.95	0.00	0.00	0.00	0.00000	0.00
9.7590		-57.913	0	-7,146.46	-0.00045667	11,432.64
						Leveraged

















## Kentucky

Out of the 18 candidate landfills in the LMOP database, four (4) are in AEP service territory.

Landfill	Location	Potential MW	Available ?
Green Valley	Ashland, Greenup Co.	0.3	No. East KY Co-op is using this site for generation.
Cooksey Brothers	Ashland, Boyd Co.	3.6	Possibly. Ceased operations in 2005 due to repeated env. violations.
Perry County	Hazard, Perry Co.	N/A	Possibly. No data located.
Floyd County	Martin, Floyd Co.	0.3	Possibly. Closed in 2003. No other data located.

Cooksey Brothers in Ashland, where AEP has disposed of wastes over the years, is listed as closing in 2004 or 2005. Annual acceptance rate = 132,000 tons; estimated methane generation = 1.7 mmscf/day; potential electrical generation = 5 MW. If this landfill has been closed, then methane production will start decreasing, resulting in poorer LFG project economics over the long term. This landfill does appear available as an LFG project.

No data was located for the Perry County landfill in Hazard, KY, through general Internet, KY state, or USEPA LMOP database searches. This landfill is listed as having closed in 1992, thus methane production is most likely on the decline.

The Green Valley Landfill, Ashland, Greenup County, has already been developed by East Kentucky Power Cooperative. Four (4) small reciprocating engines are in place generating 0.32 MW of electricity.

The Floyd County Landfill, Martin, Floyd County, appears to have been closed in 2003. LMOP data shows only 346,000 tons of waste in place, thus not providing much in the way of methane generation. Project economics are most likely not favorable for electricity generation.

With respect to permitting, Kentucky has a general air quality permit for LFG to energy projects. Specific provisions for this type of permit include:

- Landfill Gas to Energy Projects are regulated by 40 CFR 60 Subpart WWW. The internal combustion engines operate as enclosed combustor type controls as described in Subpart WWW. The engines must achieve 98 weight-percent reduction of nonmethane organic compounds or reduce

outlet nonmethane organic compounds to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen.

- Emission factors were obtained from internal combustion engine manufacturers and from AP-42.
- 40 CFR 60 Subpart WWW - Standards of Performance for Municipal Solid Waste is applicable.
- EPA Region 4 has approved an alternative monitoring plan to replace the combustion temperature monitoring required by Subpart WWW.



**VIA FEDERAL EXPRESS**

ADM. CASE NO. 2007-00477  
ITEM NO. 3  
ATTACHMENT D  
Page 1 of 12

*Confidential*

March 30, 2006

Mr. Thomas Fecho  
AEP Service Corporation  
1 Riverside Plaza  
Columbus, OH 43215

Dear Mr. Fecho:

**Hanging Rock – Jefferson 765kV 1200 MW (N43) project Withdraw**

This letter serves as confirmation that the **Hanging Rock – Jefferson 765kV 1200 MW (N43)** project has been withdrawn from the PJM queue, effective 3/28/06.

If you have any further questions, please call me at 610-666-4725.

Sincerely,

Diane Lake  
Generation Interconnection Administrator  
Tariff Administration Department

dml: #287851

cc: M. A. Gray  
D. E. Heyd  
P. Castro  
M. Jasper  
B. L. Pickett  
S. W. Hoff  
J. C. Baker

***PJM Generator Interconnection Request  
Queue #N43  
Hanging Rock-Jefferson (Carrs) 765kV  
Impact Study***

**359006  
February 2006**

**General**

AEPSC, as agent for Operating Companies of AEP System (Interconnection Customer) proposes to install two 600 MW Integrated Gasification Combined Cycle (IGCC) generating facilities, each comprised of two combustion turbine generators and one steam turbine generator at their Carrs site. The proposed generating facility site is located adjacent to the Ohio River in Vanceburg, Lewis County, Kentucky. The project has position N43 in the PJM Generation Interconnection queue. The project in-service date is scheduled for the May 1, 2010.

**Direct Connection**

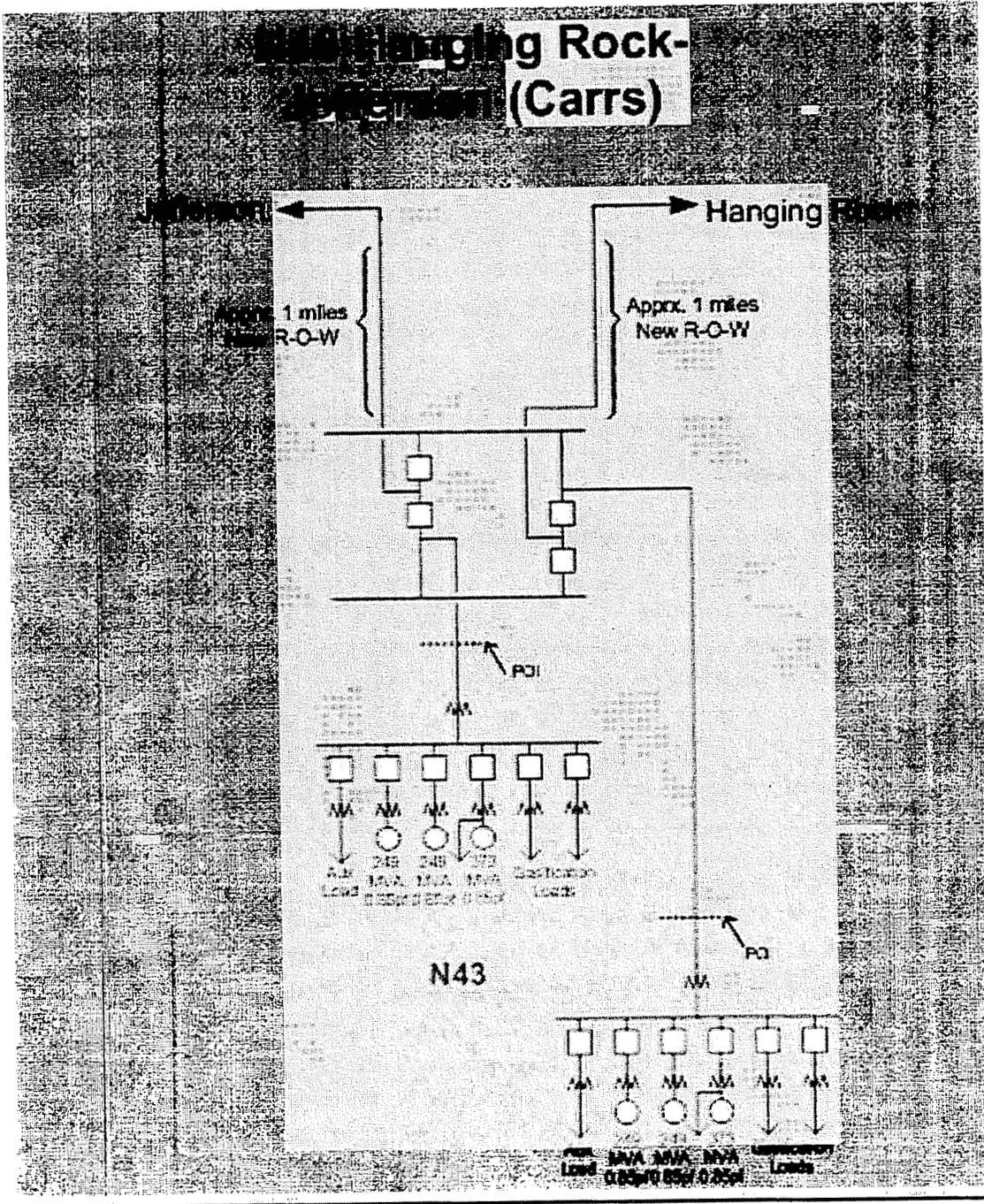
The project was evaluated with both 600 MW plants connected independently to the 765 kV Hanging Rock-Jefferson 765kV transmission line.

To connect the two proposed 600 MW IGCC plants to the Hanging Rock-Jefferson 765kV transmission line a new four breaker ring bus will need to be constructed at the interconnection with the line and two circuits, approximately 1 mile each, on separate rights-of-way, will need to be built from the Carrs generation site to the interconnection. See Figure #1. If only one 600 MW plant is connected to the 765kV, then a three breaker ring bus is sufficient. The estimated direct connection costs for the interconnection of the two 600 MW plants are listed below.

Unit 1 – add three 765 kV circuit breakers, associated bus and relay facilities.	<b>\$ 20,828,000</b>
Unit 2 – add one 765 kV circuit breaker, associated bus and relay facilities.	<b>\$ 5,172,000</b>
765kV substation is Upgrade #n0482.	
Trans. Lines – construct two one-mile long circuits	<b><u>\$ 11,997,000</u></b>
Trans. Exit #1 is Upgrade #n0483. Trans. Exit #2 is Upgrade #n0484.	
Total	<b>\$ 37,997,000</b>

It is estimated this work can be completed to meet the May 2010 in-service date.

Figure #1



### **Network Impacts**

The #N43 project was studied as an injection of 1200 MW into a new substation inserted into the Hanging Rock – Jefferson 765 kV circuit. Project #N43 was evaluated for compliance with reliability criteria for summer peak conditions in 2009. Potential network impacts were as follows:

#### **PJM Generator and Load Deliverability Results**

- For outage of the Belmont-Harrison 500kV circuit the Kammer 765/500 kV transformer is overloaded at 111.6 % of its emergency rating of 1536 MVA. The N42 project provides 178.3 MW to the overload.

#### **NERC Category A & B Contingency – Load Flow Results**

- Under system normal conditions the Waterford-Muskingum 345kV circuit is overloaded to 115.2% of its normal rating. The N42 project contributes 62 MW to the flow on the circuit.

#### **NERC Category C Contingencies – Load Flow Results**

No problems identified.

#### **Double Contingencies**

No problems identified.

#### **Short Circuit Analysis**

No identified problems.

#### **Stability (ECAR Document #1)**

Stability analysis was performed at 2009 summer light load conditions and peak load conditions. The maximum generation output is considered. Attachment #1 lists the fault cases evaluated. The range of contingencies evaluated included all that were deemed necessary to assess expected compliance with ECAR criteria.

The study shows that, with all transmission facilities in service in the vicinity of the proposed project, the dynamics performance of the system for the planning criteria contingencies should remain satisfactory. Hence, N43 project will not require system reinforcement for system stability.

When the Hanging Rock – North Proctorville 765 KV line is out of service (Pre-disturbance outage Case T), several contingencies cause instability of several generators in the area. As a remedial measure, for an extended outage of Hanging Rock – North Proctorville 765 KV line (expected to be for extended duration), the N43 project should be removed from service. (Note: Additional generation reductions from other plants would also be needed for stability.)

Note: While the stability analysis has been performed at expected extreme system conditions, there is a potential that evaluation at a different level of generator MW and/or MVAR output at different system load levels and operating conditions would disclose unforeseen stability problems. The regional reliability analysis routinely performed to test all system changes will

include one such evaluation. Any problems uncovered in that or other operating or planning studies will need to be resolved.

Moreover, when the proposed generating station is designed and unit specific dynamics data for the turbine generators and its controls are available, and if it is different than the data provided for this study, a transient stability analysis at a variety of expected operating conditions using the more accurate data shall be performed to verify impact on the dynamic performance of the system. As more accurate or unit specific dynamics data for the proposed facility, as well as Plant layout become available, it must be forwarded to PJM.

### New System Reinforcements

There are no new system reinforcements identified for the N43 project.

### Contribution to Previously Identified System Reinforcements

The N43 project contributes to the two previously identified upgrades described below.

- The overload of the Kammer transformer can be alleviated by replacing the existing 1500 MVA transformer with three single phase units rated at 600 MVA each and a 600 MVA spare and replacing other substation equipment as required. (Upgrade # n0480) The estimated cost for the replacement is \$ 18,000,000. The estimated lead time for replacement is 24 months.
- The overload on the Waterford-Muskingum 345kV circuit can be alleviated by reconductoring approximately 1 mile of the circuit out of Waterford and changing line risers at Muskingum. (Upgrade # n0479) These changes can be accomplished prior to the in-service date of the IGCC in May 2010. The estimated cost is \$1.2 million.

### Cost Allocation

The N43 project is responsible for 100% of the \$37.997 million estimated cost described in the direct connection portion of this report.

The N43 project will have allocations as listed below for network upgrades n0479 and n0480.

Upgrade #	Description	Agency	Start Date	Completion %	Estimated Cost (\$)	Allocated %	Allocated Cost (\$)	Remaining Cost (\$)	Total Cost (\$)
479	Reconductor Waterford-Muskingum	AEP	06/01/10	0%	1,200	72%	28%	158	62
480	Replace Kammer 765/500 kV Transformer	AEP	06/01/10	0%	18,000	15%	85%	32.6	176.3

For network upgrade n0479 the N43 allocation is \$0.34 million.

For network upgrade n0480 the N43 allocation is \$15.3 million.

The total estimated cost for the facilities required to interconnect the N43 project is \$53.637 million

**Attachment #1**

**N43**

**2009 Summer Light/Peak Load Case Stability Faults**

**BREAKER CLEARING TIMES (CYCLES)**

Station	Primary (3ph/slg)	Stuck Breaker (total)	Zone 2 (total)	re-closing
765 kV	4	14	-	-
345 kV	4	15	-	-

**Unstable cases caused by the project are highlighted in Red. Unstable cases due to the baseline problem are highlighted in blue.**

**With all Transmission Facilities in Service:**

- N43-1a: 3ph @ N43Carrs on N43Carrs-Hanging Rock
- N43-1b: slg @ N43Carrs on N43Carrs-Hanging Rock, stuck @ N43Carrs l/o 1 N43 CT/ST
- N43-2a: 3ph @ N43Carrs on N43Carrs-Jefferson
- N43-2b: slg @ N43Carrs on N43Carrs-Jefferson, stuck @ N43Carrs l/o 1 N43 CT/ST
- N43-3a: 3ph @ Hanging Rock on Hanging Rock-Don Marquis
- N43-3b1: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, l/o Hanging Rock-Baker
- N43-3b2: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, l/o Hanging Rock-Cornu
- N43-4a: 3ph @ Hanging Rock on Hanging Rock-Cornu
- N43-4b: slg @ Hanging Rock on Hanging Rock-Cornu, stuck @ Hanging Rock
- N43-5a: 3ph @ Hanging Rock on Hanging Rock-Baker
- N43-5b: slg @ Hanging Rock on Hanging Rock-Baker, stuck @ Hanging Rock, l/o Hanging Rock-Don Marquis
- N43-6a: 3ph @ Hanging Rock on Hanging Rock-N. Proctorville
- N43-6b1: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o Hanging Rock-Lawrenz
- N43-6b2: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o Hanging Rock-Cornu
- N43-7a: 3ph @ Hanging Rock on Hanging Rock-Lawrenz
- N43-7b: slg @ Hanging Rock on Hanging Rock-Lawrenz, stuck @ Hanging Rock, l/o Hanging Rock N. Proctorville
- N43-8a: 3ph @ Jefferson on Jefferson-Greentown
- N43-8b: slg @ Jefferson on Jefferson-Greentown, stuck @ Jefferson, l/o Jefferson-Rockport
- N43-9a: 3ph @ Jefferson on Jefferson-Rockport
- N43-9b1: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Greentown
- N43-9b2: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Clifty Creek 345kV
- N43-10a: 3ph @ Jefferson on Jefferson-Clifty Creek 345kV
- N43-10b: slg @ Jefferson on Jefferson-Clifty Creek, stuck @ Jefferson, l/o Jefferson-Rockport

N43-11b1: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Greentown  
N43-11b2: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Clifty Creek

**With N43 Carrs to Jefferson line out of service (Pre-disturbance outage P):**

N43P-3a: 3ph @ Hanging Rock on Hanging Rock-Don Marquis  
N43P-3b1: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, l/o  
Hanging Rock-Baker  
N43P-3b2: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock,  
l/o Hanging Rock-Cornu  
N43P-4a: 3ph @ Hanging Rock on Hanging Rock-Cornu  
N43P-4b: slg @ Hanging Rock on Hanging Rock-Cornu, stuck @ Hanging Rock  
N43P-5a: 3ph @ Hanging Rock on Hanging Rock-Baker  
N43P-5b: slg @ Hanging Rock on Hanging Rock-Baker, stuck @ Hanging Rock, l/o Hanging  
Rock-Don Marquis  
N43P-6a: 3ph @ Hanging Rock on Hanging Rock-N. Proctorville  
N43P-6b1: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o  
Hanging Rock-Lawrenz  
N43P-6b2: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o  
Hanging Rock-Cornu  
N43P-7a: 3ph @ Hanging Rock on Hanging Rock-Lawrenz  
N43P-7b: slg @ Hanging Rock on Hanging Rock-Lawrenz, stuck @ Hanging Rock, l/o Hanging  
Rock N. Proctorville  
N43P-8a: 3ph @ Jefferson on Jefferson-Greentown  
N43P-8b: slg @ Jefferson on Jefferson-Greentown, stuck @ Jefferson, l/o Jefferson-Rockport  
N43P-9a: 3ph @ Jefferson on Jefferson-Rockport  
N43P-9b1: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Greentown  
N43P-9b2: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Clifty Creek  
345kV  
N43P-10a: 3ph @ Jefferson on Jefferson-Clifty Creek 345kV  
N43P-10b: slg @ Jefferson on Jefferson-Clifty Creek, stuck @ Jefferson, l/o Jefferson-Rockport  
N43P-11b1: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Greentown  
N43P-11b2: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Clifty  
Creek

**With N43 Carrs to Hanging Rock line out of Service (Pre-disturbance outage Q):**

N43Q-8a: 3ph @ Jefferson on Jefferson-Greentown  
N43Q-8b: slg @ Jefferson on Jefferson-Greentown, stuck @ Jefferson, l/o Jefferson-Rockport  
N43Q-9a: 3ph @ Jefferson on Jefferson-Rockport  
N43Q-9b1: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Greentown  
N43Q-9b2: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Clifty Creek  
345kV  
N43Q-10a: 3ph @ Jefferson on Jefferson-Clifty Creek 345kV  
N43Q-10b: slg @ Jefferson on Jefferson-Clifty Creek, stuck @ Jefferson, l/o Jefferson-Rockport

**With Hanging Rock to Don Marquis line out of Service (Pre-disturbance outage R):**

N43R-1a: 3ph @ N43Carrs on N43Carrs-Hanging Rock  
N43R-1b: slg @ N43Carrs on N43Carrs-Hanging Rock, stuck @ N43Carrs l/o 1 N43 CT/ST  
N43R-2a: 3ph @ N43Carrs on N43Carrs-Jefferson  
N43R-2b: slg @ N43Carrs on N43Carrs-Jefferson, stuck @ N43Carrs l/o 1 N43 CT/ST  
N43R-4a: 3ph @ Hanging Rock on Hanging Rock-Cornu  
N43R-4b: slg @ Hanging Rock on Hanging Rock-Cornu, stuck @ Hanging Rock  
N43R-5a: 3ph @ Hanging Rock on Hanging Rock-Baker  
N43R-5b: slg @ Hanging Rock on Hanging Rock-Baker, stuck @ Hanging Rock, l/o Hanging Rock-Don Marquis  
N43R-6a: 3ph @ Hanging Rock on Hanging Rock-N. Proctorville  
N43R-6b1: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o Hanging Rock-Lawrenz  
N43R-6b2: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o Hanging Rock-Cornu  
N43R-7a: 3ph @ Hanging Rock on Hanging Rock-Lawrenz  
N43R-7b: slg @ Hanging Rock on Hanging Rock-Lawrenz, stuck @ Hanging Rock, l/o Hanging Rock N. Proctorville  
N43R-8a: 3ph @ Jefferson on Jefferson-Greentown  
N43R-8b: slg @ Jefferson on Jefferson-Greentown, stuck @ Jefferson, l/o Jefferson-Rockport  
N43R-9a: 3ph @ Jefferson on Jefferson-Rockport  
N43R-9b1: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Greentown  
N43R-9b2: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Clifty Creek 345kV  
N43R-10a: 3ph @ Jefferson on Jefferson-Clifty Creek 345kV  
N43R-10b: slg @ Jefferson on Jefferson-Clifty Creek, stuck @ Jefferson, l/o Jefferson-Rockport  
N43R-11b1: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Greentown  
N43R-11b2: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Clifty Creek

**With Hanging Rock to Baker line out of Service (Pre-disturbance outage S):**

N43S-1a: 3ph @ N43Carrs on N43Carrs-Hanging Rock  
N43S-1b: slg @ N43Carrs on N43Carrs-Hanging Rock, stuck @ N43Carrs l/o 1 N43 CT/ST  
N43S-2a: 3ph @ N43Carrs on N43Carrs-Jefferson  
N43S-2b: slg @ N43Carrs on N43Carrs-Jefferson, stuck @ N43Carrs l/o 1 N43 CT/ST  
N43S-3a: 3ph @ Hanging Rock on Hanging Rock-Don Marquis  
N43S-3b1: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, l/o Hanging Rock-Baker  
N43S-3b2: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, l/o Hanging Rock-Cornu  
N43S-4a: 3ph @ Hanging Rock on Hanging Rock-Cornu  
N43S-4b: slg @ Hanging Rock on Hanging Rock-Cornu, stuck @ Hanging Rock Rock-Don Marquis  
N43S-6a: 3ph @ Hanging Rock on Hanging Rock-N. Proctorville  
N43S-6b1: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o

**Hanging Rock-Lawrenz**

- N43S-6b2: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, I/o Hanging Rock-Cornu
- N43S-7a: 3ph @ Hanging Rock on Hanging Rock-Lawrenz
- N43S-7b: slg @ Hanging Rock on Hanging Rock-Lawrenz, stuck @ Hanging Rock, I/o Hanging Rock N. Proctorville
- N43S-8a: 3ph @ Jefferson on Jefferson-Greentown
- N43S-8b: slg @ Jefferson on Jefferson-Greentown, stuck @ Jefferson, I/o Jefferson-Rockport
- N43S-9a: 3ph @ Jefferson on Jefferson-Rockport
- N43S-9b1: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, I/o Jefferson-Greentown
- N43S-9b2: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, I/o Jefferson-Clifty Creek 345kV
- N43S-10a: 3ph @ Jefferson on Jefferson-Clifty Creek 345kV
- N43S-10b: slg @ Jefferson on Jefferson-Clifty Creek, stuck @ Jefferson, I/o Jefferson-Rockport
- N43S-11b1: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, I/o Jefferson-Greentown
- N43S-11b2: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, I/o Jefferson-Clifty Creek

**With Hanging Rock to N. Proctorville line out of Service (Pre-disturbance outage T):**

- N43T-1a: 3ph @ N43Carrs on N43Carrs-Hanging Rock
- N43T-1b: slg @ N43Carrs on N43Carrs-Hanging Rock, stuck @ N43Carrs I/o 1 N43 CT/ST
- N43T-2a: 3ph @ N43Carrs on N43Carrs-Jefferson
- N43T-2b: slg @ N43Carrs on N43Carrs-Jefferson, stuck @ N43Carrs I/o 1 N43 CT/ST
- N43T-3a: 3ph @ Hanging Rock on Hanging Rock-Don Marquis
- N43T-3b1: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, I/o Hanging Rock-Baker**
- N43T-3b2: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, I/o Hanging Rock-Cornu
- N43T-4a: 3ph @ Hanging Rock on Hanging Rock-Cornu
- N43T-4b: slg @ Hanging Rock on Hanging Rock-Cornu, stuck @ Hanging Rock
- N43T-5a: 3ph @ Hanging Rock on Hanging Rock-Baker
- N43T-5b: slg @ Hanging Rock on Hanging Rock-Baker, stuck @ Hanging Rock, I/o Hanging Rock-Don Marquis**
- N43T-7a: 3ph @ Hanging Rock on Hanging Rock-Lawrenz
- N43T-7b: slg @ Hanging Rock on Hanging Rock-Lawrenz, stuck @ Hanging Rock, I/o Hanging Rock N. Proctorville
- N43T-8a: 3ph @ Jefferson on Jefferson-Greentown
- N43T-8b: slg @ Jefferson on Jefferson-Greentown, stuck @ Jefferson, I/o Jefferson-Rockport
- N43T-9a: 3ph @ Jefferson on Jefferson-Rockport
- N43T-9b1: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, I/o Jefferson-Greentown
- N43T-9b2: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, I/o Jefferson-Clifty Creek 345kV

N43T-10a: 3ph @ Jefferson on Jefferson-Clifty Creek 345kV  
N43T-10b: slg @ Jefferson on Jefferson-Clifty Creek, stuck @ Jefferson, l/o Jefferson-Rockport  
N43T-11b1: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Greentown  
N43T-11b2: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Clifty  
Creek

**With Jefferson to Greentown line out of Service (Pre-disturbance outage U):**

N43U-1a: 3ph @ N43Carrs on N43Carrs-Hanging Rock  
N43U-1b: slg @ N43Carrs on N43Carrs-Hanging Rock, stuck @ N43Carrs l/o 1 N43 CT/ST  
N43U-2a: 3ph @ N43Carrs on N43Carrs-Jefferson  
N43U-2b: slg @ N43Carrs on N43Carrs-Jefferson, stuck @ N43Carrs l/o 1 N43 CT/ST  
N43U-3a: 3ph @ Hanging Rock on Hanging Rock-Don Marquis  
N43U-3b1: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock, l/o  
Hanging Rock-Baker  
N43U-3b2: slg @ Hanging Rock on Hanging Rock-Don Marquis, stuck @ Hanging Rock,  
l/o Hanging Rock-Cornu  
N43U-4a: 3ph @ Hanging Rock on Hanging Rock-Cornu  
N43U-4b: slg @ Hanging Rock on Hanging Rock-Cornu, stuck @ Hanging Rock  
N43U-5a: 3ph @ Hanging Rock on Hanging Rock-Baker  
N43U-5b: slg @ Hanging Rock on Hanging Rock-Baker, stuck @ Hanging Rock, l/o Hanging  
Rock-Don Marquis  
N43U-6a: 3ph @ Hanging Rock on Hanging Rock-N. Proctorville  
N43U-6b1: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o  
Hanging Rock-Lawrenz  
N43U-6b2: slg @ Hanging Rock on Hanging Rock-N. Proctorville, stuck @ Hanging Rock, l/o  
Hanging Rock-Cornu  
N43U-7a: 3ph @ Hanging Rock on Hanging Rock-Lawrenz  
N43U-7b: slg @ Hanging Rock on Hanging Rock-Lawrenz, stuck @ Hanging Rock, l/o Hanging  
Rock N. Proctorville  
N43U-9a: 3ph @ Jefferson on Jefferson-Rockport  
N43U-9b1: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Greentown  
N43U-9b2: slg @ Jefferson on Jefferson-Rockport, stuck @ Jefferson, l/o Jefferson-Clifty Creek  
345kV  
N43U-10a: 3ph @ Jefferson on Jefferson-Clifty Creek 345kV  
N43U-10b: slg @ Jefferson on Jefferson-Clifty Creek, stuck @ Jefferson, l/o Jefferson-Rockport  
N43U-11b1: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Greentown  
N43U-11b2: slg @ Jefferson on Jefferson-N43Carrs, stuck @ Jefferson, l/o Jefferson-Clifty  
Creek





## **Eastern States Site Selection Study**

**Prepared for  
American Electric Power**

**November 11, 2004  
Final Report – rev.3  
S&L Project Number 11488-016**

**Sargent & Lundy<sup>LLC</sup>**

**Sargent & Lundy LLC  
55 East Monroe Street  
Chicago, IL 60603-5780 USA**

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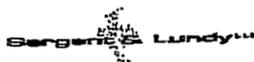
Sargent & Lundy

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## Eastern States Site Selection Study

Project No. 11488-016

Revision	Date	Purpose	Disseminated	Reviewed by	Approved
0	10/21/04	Draft Report	Tim Krause/Ron Cook/Dan Marmer/Dilip Bhatt	Ejaz Shameem	Steve Bertheau
1	10/25/04	Revised Draft Report	Tim Krause/Ron Cook/Dan Marmer/Dilip Bhatt	Ejaz Shameem	Steve Bertheau
2	10/26/04	Revised Draft Report	Tim Krause/Ron Cook/Dan Marmer/Dilip Bhatt	Ejaz Shameem	Steve Bertheau
Final	11/2/04	Final Report	Tim Krause/Ron Cook/Dan Marmer/Dilip Bhatt	Ejaz Shameem	Steve Bertheau

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B. Site Evaluation Criteria	
C. Photographs of Visited Sites	
D. List of AEP Documents Used in the Site Evaluations	
E. Paper by Sargent and Lundy, titled "Design Information for 1,000 to 1,200 MW(net) Integrated Gasification Combined Cycle Plant"	
F. Generic General Arrangement Plan "Site Development, 1,000 to 1,200 MW IGCC"	
G. Site Layout Drawings	
H. Interconnection Concept Diagrams	
I. Site Rating Spreadsheet	

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## Executive Summary

American Electric Power Company (AEP) contracted Sargent and Lundy (S&L) to evaluate potential sites for development of an Integrated Gasification Combined Cycle (IGCC) power plant. The sites were evaluated for their potential to support one or two 500-600 MW IGCC units in a 2x2x1 configuration. The objective of the study was to recommend one preferred and one alternate site in each state.

AEP identified the following 15 sites for evaluation by S&L:

### Indiana

[REDACTED]

### Kentucky

- Carrs (greenfield site)
- St. Paul (greenfield site)

### Ohio

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

### Tennessee

- [REDACTED]

### Virginia

- [REDACTED]
- [REDACTED]

### West Virginia

- [REDACTED]
- [REDACTED]

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Sergeant S. Lundy

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S&L evaluated the selected sites for technical and environmental characteristics that affect site suitability. To support the site evaluations, S&L developed the footprint and other basic plant requirements for one and two 500-600 MW units. All evaluations of transmission and related electrical interconnection suitability were performed by AEP.

The sites were evaluated using the evaluation criteria shown in Appendix B. The criteria represent 25 characteristics considered most important in determining the suitability of the identified sites for an IGCC plant. The criteria provide an objective means of assigning numerical scores to the sites for each site characteristic, indicating how well the site satisfies the desired conditions. The criteria also include Importance Weighting Factors, which are used to adjust the numerical scores based on the relative importance of each characteristic.

Based on the total weighted scores (obtained by summing the numerical scores for all characteristics after multiplying each score by its Importance Weighting Factor), the sites rank as follows:

Site	Total Weighted Score
[REDACTED]	[REDACTED]

[REDACTED]

Based on the numerical scores and qualitative evaluations of the advantages and disadvantages of each site, S&L selected one preferred and one alternate site in each state for recommendation to AEP. Our recommendations are listed below. The total weighted score for each site is shown in parentheses, and the states are ranked according to the scores of the preferred sites.

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West Virginia

Preferred: [REDACTED]  
Alternate: [REDACTED]

Ohio

Preferred: [REDACTED]  
Alternate: [REDACTED]

Kentucky

Preferred: [REDACTED]  
Alternate: [REDACTED]

Indiana

Preferred: [REDACTED]  
Alternate: [REDACTED]

Tennessee

Preferred: [REDACTED]

Virginia

[REDACTED]  
[REDACTED]

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## 1. Introduction

In September 2004 American Electric Power Company (AEP) contracted Sargent and Lundy (S&L) to evaluate potential sites for development of an Integrated Gasification Combined Cycle (IGCC) power plant. The sites were evaluated for their potential to support one or two 500-600 MW IGCC units in a 2x2x1 configuration. The objective of the study was to recommend one preferred and one alternate site in each state.

AEP identified the following 15 sites for evaluation by S&L:

### Indiana

- [REDACTED]
- [REDACTED]

### Kentucky

- [REDACTED]
- [REDACTED]

### Ohio

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

### Tennessee

- [REDACTED]

### Virginia

- [REDACTED]
- [REDACTED]

### West Virginia

- [REDACTED]
- [REDACTED]
- [REDACTED]

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In order to select these sites, AEP performed preliminary screening of both greenfield and brownfield AEP-owned land in seven eastern states (i.e., Indiana, Kentucky, Michigan, Ohio, Tennessee, Virginia, and West Virginia). In some cases, AEP screened out sites because it was obvious that there were fatal flaws such as inadequate land space. These decisions are documented in the notes of a September 16, 2004, conference call, which are included in Appendix A to this report.

[REDACTED]

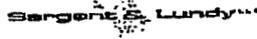
S&L evaluated the selected sites for technical and environmental characteristics that affect site suitability. All evaluations of transmission and related electrical interconnection suitability were performed by AEP.

To support the site evaluations, S&L developed the footprint for a 500-600 MW 2x2x1 IGCC unit and prepared overlays of this footprint on maps of the sites. S&L also established the following basic plant requirements for one or two 500-600 MW units:

Plant Requirement	Component	One 2x2x1 Unit 500-600 MW	Two 2x2x1 Units 1,000-1,200 MW
Coal Consumption	-	[REDACTED]	[REDACTED]
Makeup Water Flow	-	[REDACTED]	[REDACTED]
Acreage	[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]	[REDACTED]
Operating Staff	-	[REDACTED]	[REDACTED]

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The following sections of this report describe the methods and results of the site evaluations.

[REDACTED]

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## 2. Evaluation Criteria

The criteria used to evaluate the sites were mutually agreed upon by AEP and S&L at the beginning of the study. These criteria were filtered from more extensive sets of criteria typically used by AEP and S&L. The selected criteria represent 25 characteristics considered most important in determining the suitability of the identified sites for an IGCC plant. The characteristics and evaluation criteria are listed in Appendix B.

The criteria are divided into requirements, termed "Musts", and desirable features, termed "Wants". "Musts" are environmental or engineering conditions considered necessary for a site to be feasible to permit and develop. "Wants" are environmental or engineering conditions desired so that a site is readily permittable, economically attractive, and favorable to develop. The criteria provide an objective means of assigning numerical scores to the sites for each "Want", indicating how well the site satisfies the desired conditions. The criteria also include Importance Weighting Factors, which are used to adjust the numerical scores based on the relative importance of each characteristic.

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### 3. Data Collection and Site Descriptions

Information on the sites was collected from published maps, aerial photographs, and other publicly available data, as well as from previous site studies and environmental investigations performed by AEP. Government agencies were contacted in order to obtain relevant generic information, but AEP requested that no site-specific contacts be made with government agencies.

In order to confirm and supplement the information collected through published sources, field reconnaissance was conducted. The sites were observed from all nearby public roads, and from private roads where access was available. The participants in the site visits were Dilip Bhatt and Daniel Marmer of Sargent and Lundy and Glenn Davis and Mike Dancison of AEP, with part-time support from Terry Fuller and John Hendricks of AEP. The following sites were visited from September 21 through September 24, 2004: [REDACTED], St. Paul, [REDACTED], Carrs, [REDACTED]

Representative photographs taken during the site visits are included in Appendix C. A list of documents obtained from AEP that were used in the site evaluations is included in Appendix D.

[REDACTED] The data collected and observations made for the other thirteen sites are summarized below.

#### Existing Plant Sites

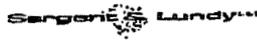
[REDACTED]

[REDACTED]

[REDACTED]

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Sergent, Lundy

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#### 4. Site Layouts, Constructibility, and Coal Deliverability

Preliminary site layouts were prepared for the sites listed below. The layouts were based on the generic design information included in Appendixes E and F. The site specific layout drawings are included in Appendix G.

##### Existing Plant Sites

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

##### Greenfield Sites

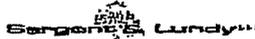
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- St Paul
- Carrs

##### Virginia Sites

- [REDACTED]
  - [REDACTED]
- [REDACTED]
- [REDACTED]

The following paragraphs describe some of the key information that was developed to support the site layouts.

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Railroad Loop Track

Sites that would receive coal by rail must be provided with a loop track or a string of ladder tracks for coal unloading. The train assumed for sizing the loop track has 100 cars, each 53.5 feet long, and three engines, each 80 feet long. The total length of the train is 5,600 feet. For a loop track the design basis is to fit the entire length of the train on either side of the car dumper while the train is unloading, and to avoid blocking a surface road with public traffic for more than 10 minutes. For a ladder track the design basis was to add three tracks at about 3,000 linear feet each in addition to the unloading track, for a total of 9,000 linear feet. Two of the tracks would be used to store full cars and the third track would be used to store empty cars. 100-car trains would be placed in the two full car tracks when they arrive at the plant. Cars would be removed in 25 to 50 car strings by a plant switch engine, run through the dumper to unload, and then place in empty car storage.

[REDACTED]

other sites are on navigable rivers, and barge delivery of coal was assumed.

Earthwork

Cut and fill quantities were estimated for each site by identifying an area to be graded and a grade elevation that would balance the cut and fill requirements. To account for space needed for construction laydown and parking, the area to be graded included the area occupied by the generating units, cooling towers, and coal unloading and storage. For sites with rail delivery of coal, the railroad track loop also was assumed to be graded, but the area inside the loop was not. The existing and final grade elevations and earthwork requirements at each site are as follows:

<u>Site</u>	<u>Existing Grade Elevation</u>	<u>Final Grade Elevation</u>	<u>Earthwork Volume (Cubic Yards)</u>
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
CARTS	510-600	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

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<u>Site</u>	<u>Existing Grade Elevation</u>	<u>Final Grade Elevation</u>	<u>Earthwork Volume (Cubic Yards)</u>
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
St. Paul	510-540	[REDACTED]	[REDACTED]

Notes:

(3) Site is a flat bench large enough to fit the plant and more.

### Constructibility

The site layouts and other factors were considered in evaluating how easily IGCC units could be constructed at each site. Following is a brief description of the criteria used to evaluate the major constructibility issues.

#### 1. Barge Access

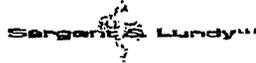
The site borders a major navigable waterway and an unloading facility exists, or can be developed, for the off-loading of large, shop fabricated modules. Barge unloading facilities allow the site to receive large assemblies, fabricated in a controlled/shop environment, saving field labor costs.

#### 2. Access from Barge Landing to Plant and Storage Areas

In order to move large modules from the barge facility to the laydown yard and erection area, roads must exist, or be developed, that will allow the movement of large modules. If the roads from the barge facility to the laydown travel up a steep grade, or through congested areas, the size of the module that can be handled will be reduced based on the ability to transport the module. Smaller modules received by barge provide some field labor savings in that they can be further combined on site, if land is available, and smaller modules are preferable to restrictions necessitated by truck shipment.

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3. Rail Access

A railroad spur to the site allows heavier/larger pieces to be shipped to the site without special permits required by large truck shipments. Bridge capacity and other use of the rail lines will determine how effective the rail spur will be.

4. Road Access into the Site

Good quality all-weather roads exist from major highways into the site. The local roads must be able to handle high volumes of truck traffic with minimal maintenance and traffic problems. Difficulties arise when there are seasonal weight restriction, bridge and pavement restrictions, and traffic volume restrictions.

5. Proximity to Major Highway

Good quality all-weather roads are in close proximity to the site, reducing the length of travel on smaller, local roads. Major roads can handle high volumes of truck traffic with minimal maintenance, traffic problems, and impact on the surrounding community.

6. Land Available for Preassembly and Storage Areas

Large land areas are required to ground fabricate and/or store large modules. This land must be relatively flat and free of overhead obstructions. In the absence of large land areas for storage, module delivery must be "just in time" so that it can be moved from the barge to the erection site.

7. Access from Assembly Area to Erection Area

In order to move modules from the storage area to the erection area, adequate roads, and clearances along the roads, must be available.

8. Land Available for Staging and Lifting Large Pieces

Lifting large modules requires large cranes and space to stage the modules for lifting. Adequate land must be available at the work area for staging lifting equipment and large modules.

These criteria were combined into an overall assessment of constructibility for each site. These assessments used to evaluate Item 24 in the site evaluation criteria (see Appendix B).

Coal Supply Conditions

Although not a site layout issue, the delivery of coal at each site was considered an important site evaluation criteria. Therefore, the factors affecting coal supply conditions were reviewed for each site using the approach described below.



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## 5. Transmission Interconnection and Deliverability Analyses

Sargent & Lundy relied on system and transmission planning information prepared by AEP's Generation and Electrical Interconnection Planning group regarding the feasibility of interconnecting each site to the AEP transmission grid. This section of the report summarizes the conceptual and analytical approach adopted by the transmission planning team to evaluate and rank the sites considered for the development of the IGCC power plant. The screening, scoring and ranking of the potential IGCC plant sites from the transmission and system development perspectives was accomplished by integrating the AEP teams prior system planning experience with preliminary power system simulation studies of the generator interconnection plans conceived for each site.

The transmission team also relied on its knowledge of the current state of development of the AEP East region generation and energy delivery systems, including the recent interconnection of many simple- and combined-cycle merchant power plants on the AEP East and neighboring utility power systems. The transmission team also took into consideration, from a strategic planning perspective, the results from AEP's on-going Integrated Resource Planning activity. Finally, it is recognized that detailed power system simulation studies, including power flow, short circuit and system dynamics are required to fully evaluate the feasibility of the project interconnection plans and the need for associated network upgrades. Such studies would be conducted by PJM after the receipt of a formal request for generator interconnection from the power plant project sponsor.

### Transmission Interconnection Planning and Screening Process

The process followed by the transmission planning team involved the following steps.

#### ➤ Data Collection

- Field inspection of six AEP controlled greenfield sites in three states, namely [REDACTED] and; Carrs and St. Paul in Kentucky;
- [REDACTED]
- Procurement and review of topographical maps to determine the location of the greenfield sites relative to AEP transmission infrastructure;
- Collection and review of AEP station one-lines for the existing plant site locations and for stations terminating transmission lines that could be affected by the IGCC plant development;

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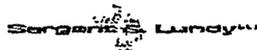
- Collection and review of AEP Operating Company transmission line statistics summarized in FERC filed Form 1 reports;
- Procurement and review of relevant manuals describing the PJM Generator Interconnection process; and
- Collection and review of Draft 2 of NERC Standard 51, Transmission System Adequacy and Security, proposed for implementation on February 8, 2005.

➤ **Conceptualization of Plant Interconnection Plans**

- One or more interconnection plans were developed for each potential plant site based on a conceptual assessment of the feasible alternatives;
- The need for the procurement of new rights-of-way associated with the required construction of extra-high voltage and/or high voltage transmission lines were assessed based on the estimated distance between each site and the point of interconnection with the AEP System
- The scope of station improvements associated with each plan were conceptualized consistent with the assumed IGCC plant layout, i.e. the number of generator step-up transformers and the energy delivery system voltage at the point of interconnection. This included, for example, consideration of the need for double transformation for any plan interconnecting the plant to the 765 or 500 kV transmission system.

➤ **2010 Summer Power Flow Base Case Development**

- A NERC 2003 series, 2010 Summer base case was used for this study;
- The representation of the AEP East energy delivery and surrounding systems included in the "off-the-shelf" base case was reviewed and a listing of the merchant generators, including their dispatch status, was prepared;
- The analysis of the locations of the fifteen potential IGCC plant sites with respect to the merchant power plants resulted in the creation of four base cases for use in the preliminary power flow screening study;
- Each of the four base cases included the modeling of power production from certain IPP combined cycle power plants so as to more heavily load the transmission system in the vicinity of the proposed IGCC plant. For the screening study, the simple cycle IPP plants were noted but not modeled at their full output.



➤ **2010 Summer Peak Modeling of the IGCC Plant**

- The conceptualized IGCC plant interconnection plan for each site was modeled on one of the four base cases determined by the application of engineering judgment regarding how the IPP combined cycle power plants could interact with the proposed IGCC plant project.
- The modeling of the plant at its initial 600 MW net power delivery provided an indicative estimate of the power flow patterns and loadings on the local area transmission system resulting from the introduction of the plant. The results for each site were screened to identify transmission facilities that load to 90% or more of their summer normal thermal capability.
- To further screen the sites, a limited set of single contingencies were evaluated to determine what transmission facilities, if any, load to 100% or more of their summer normal thermal capability.

➤ **2010 Summer Peak Modeling of the IGCC Plant Expansion**

- The IGCC plant sites were further screened to determine which sites, from the transmission interconnection and system integration perspectives, were feasible to consider the addition of a second 600 MW unit;
- The results of the conceptualization of the transmission interconnection plans associated with the IGCC plant expansion were modeled in one of the four base cases consistent with the 600 MW plant approach.
- The modeling of the two-unit plant with 1,200 MW net power delivered to the grid provided an indicative estimate of the power flow patterns and loadings on the local area transmission system resulting from the introduction of the two unit plant. The results for each site were screened to identify transmission facilities that load to 90% or more of their summer normal thermal capability.
- To further screen the sites, a limited set of single contingencies were evaluated to determine what transmission facilities, if any, load to 100% or more of their summer thermal capability with the two-unit, 1,200 MW plant modeled.

➤ **Objective Scoring of Plant Sites**

- The plant sites were screened and objectively rated according to the three transmission-related evaluation criteria shown in Appendix B, namely Item 7 (Distance from Transmission Connection Point), Item 8 (System Stability) and Item 9 (Feasibility of 2 Unit Transmission Plan).

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### Conceptual Transmission Interconnection Plans

The interconnection plans conceived for the alternative IGCC plant sites are unique from one site to the next and vary in several material respects. The principal issues considered when conceptualizing the alternative plans are the following:

- Adequacy of the planned plant/transmission interface at the point of interconnection
- Transmission voltage at the point of interconnection (138, 230, 345, 500 or 765 kV)
- Recognition of additional costs associated with the double transformation to establish the 500 kV and 765 kV interconnections
- Scope of required transmission infrastructure to establish the interconnection, particularly the need for new transmission line construction on new rights-of-way
- Scope of station construction and the need to mitigate short circuit duties at older stations, [REDACTED]
- Potential IGCC plant interaction with existing AEP and/or IPP plants in close electrical proximity to the proposed development site.
- Potential interaction with planned IPP power plant projects in the PJM/AEP queue. [REDACTED]
- Interface between AEP/PJM and neighboring utilities, [REDACTED]

### Site Transmission Interconnection Plans

The following paragraphs outline the alternative plans conceived for interconnecting the IGCC plant to the AEP System. The interconnection concepts are illustrated in the diagrams included in Appendix H. For some sites, more than one interconnection plan could be feasible, which is viewed positively at this stage in the site screening process. For one site, the scope of the required transmission improvements and related network upgrades are judged to be so large that the site is rendered incompatible with the proposed scope and timetable for the IGCC project. These attributes are reflected in the objective scoring of the sites and in the discussion of the relative advantages and disadvantages of the portfolio of sites.

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[REDACTED]

[REDACTED]

[REDACTED]

St. Paul (Kentucky)

The plan of interconnection for an IGCC plant development at the St. Paul site would involve the construction of two, ten mile single circuit 765 kV transmission lines on new rights-of-way to intersect the Hanging Rock-Jefferson 765 kV transmission line. The Hanging Rock-Jefferson 765 kV line would be severed at the point of intersection and reconnected with the new line sections so as to form two outlets from the IGCC plant station.

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Carrs (Kentucky)

The plan of interconnection for an IGCC plant development at the Carrs site would involve the construction of two, one mile or less single circuit 765 kV transmission lines on the plant property to intersect the Hanging Rock-Jefferson 765 kV transmission line. The Hanging Rock-Jefferson 765 kV line would be severed at the point of intersection and reconnected with the new line sections so as to form two outlets from the IGCC plant station. Electrically, this plan is similar to the plan of interconnection for the St. Paul site; however, it is significantly less expensive and less uncertain in view of the reduced need for 765 kV transmission line construction on new rights-of-way.

Objective Scoring of the Sites from the Transmission Interconnection Perspective

The conceptualization of the plans of interconnection for each of the sites provided a foundation for objectively scoring the sites from the transmission interconnection perspective according to Items 7, 8 and 9 of the site evaluation criteria, as described more fully in Section 6. Only one plan of interconnection was selected for the objective scoring of each site. However, it is important to also note that several of the sites - most notably [REDACTED] - provide more flexibility in developing a cost effective and reliable plan of interconnection than several of the other sites, [REDACTED], which are located less favorably from the transmission interconnection and operations perspectives.





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[REDACTED]

[REDACTED]

Class I Areas

The [REDACTED] sites are within 100 kilometers of a federally designated Class I Area. Very stringent air quality and visibility standards apply in Class I Areas, and experience has shown that baseload power plants located less than 100 kilometers from Class I Areas frequently have problems with air quality permitting. The potential for permitting problems at these sites should be considered before deciding to proceed with any project.

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Site	Primary Advantages	Primary Disadvantages
Kentucky		

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## 7. Selection of Preferred and Alternative Site

Based on the numerical scores and qualitative evaluations of advantages and disadvantages discussed in Section 6, S&L selected one preferred and one alternate site in each state for recommendation to AEP. Our recommendations are listed below. The total weighted score for each site is shown in parentheses, and the states are ranked according to the scores of the preferred sites.

### West Virginia

Preferred: [REDACTED]  
Alternate: [REDACTED]

### Ohio

Preferred: [REDACTED]  
Alternate: [REDACTED]

### Kentucky

Preferred: [REDACTED]  
Alternate: [REDACTED]

### Indiana

Preferred: [REDACTED]  
Alternate: [REDACTED]

### Tennessee

Preferred: [REDACTED]

### Virginia

[REDACTED]  
[REDACTED]

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**Appendix A**

**Notes of September 16, 2004, Conference Call**



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- Tim Christoff supplied a disk and hard copies of plot plans for all AEP East plant sites. This information is task 4 of the 9/7 S&L proposal. The subject plants for evaluation will be forwarded to S&L by Glenn Davis.
- Previous studies from the Greenfield sites to be evaluated will be assembled in a dataroom to be established by AEP in Columbus for review by S&L as soon as available, probably mid to late next week.
- [REDACTED]
- [REDACTED]
- Ejaz will re-issue the proposal. (This has been completed)
- The sites to be reviewed are shown on the following table:

AEP East State	Site	Land > 200 ac BF / > 400 ac G	No Transmission Issues	Comments	Sites Remaining After First Cut		AEP East State																																																								
					Greenfield	Greenfield																																																									
Kentucky	Big Sandy Cans St. Paul West Kentucky	P P X P P	P P P P P	P P P P P	P P P P P	P P P P P	P P P P P																																																								
								Kentucky	Big Sandy Cans St. Paul West Kentucky	P P X P P	P P P P P	P P P P P	P P P P P	P P P P P																																																	
															Kentucky	Big Sandy Cans St. Paul West Kentucky	P P X P P	P P P P P	P P P P P	P P P P P	P P P P P																																										
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Total		8		9		10																																																									

CONFIDENTIAL  
 GSD 8/20/2004

First Cut Evaluation

Confidential

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**Appendix B**

**Site Evaluation Criteria**

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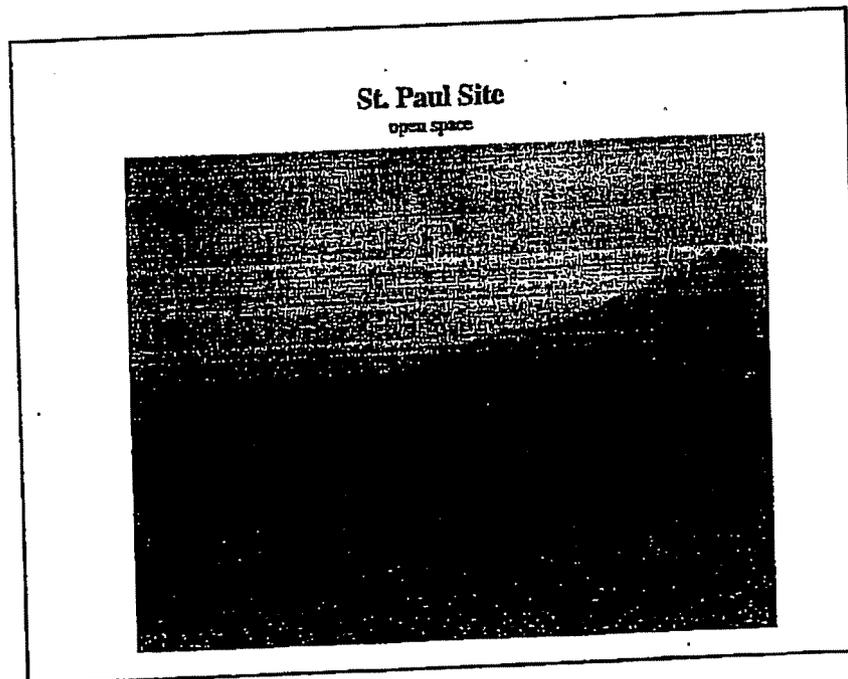
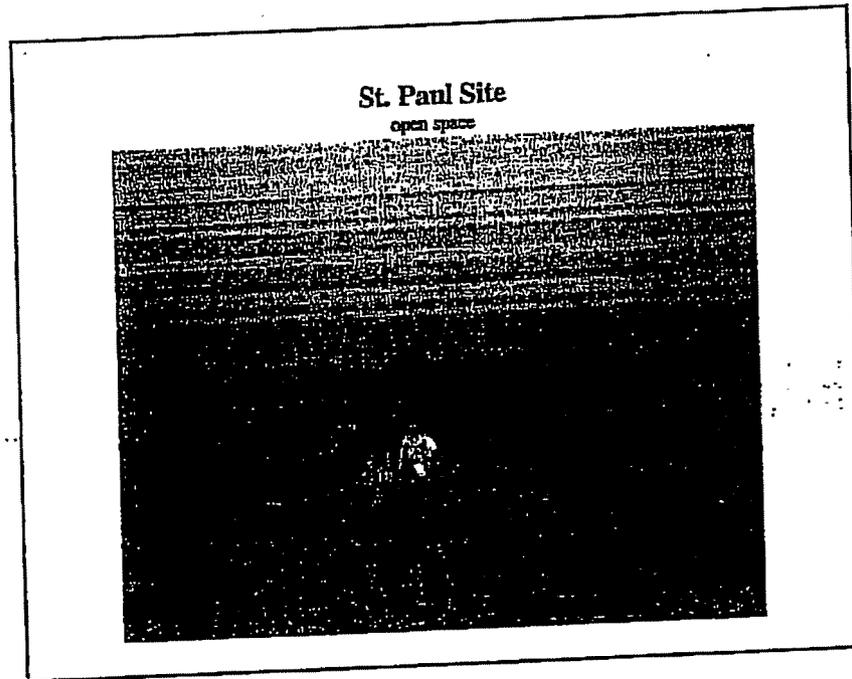


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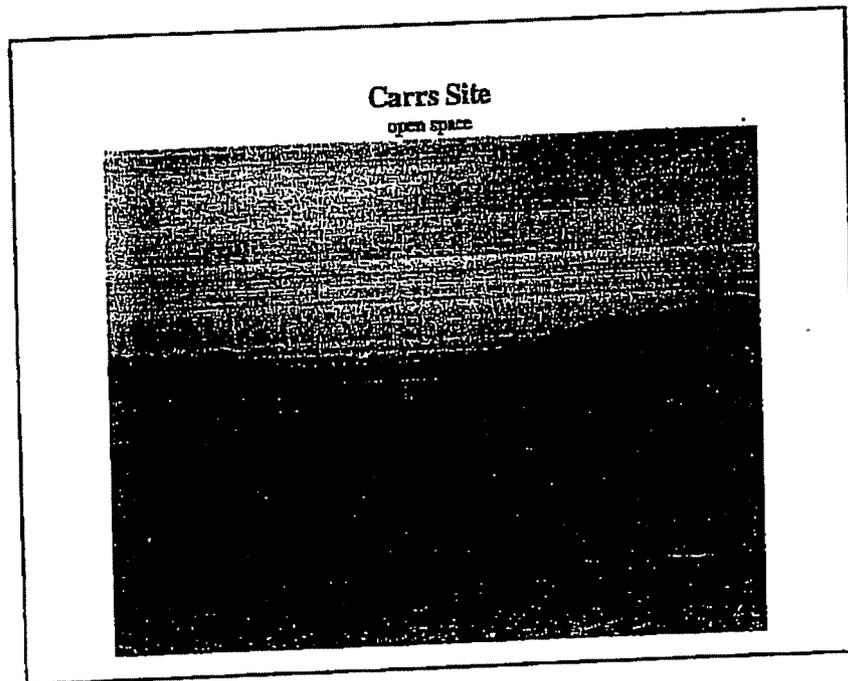
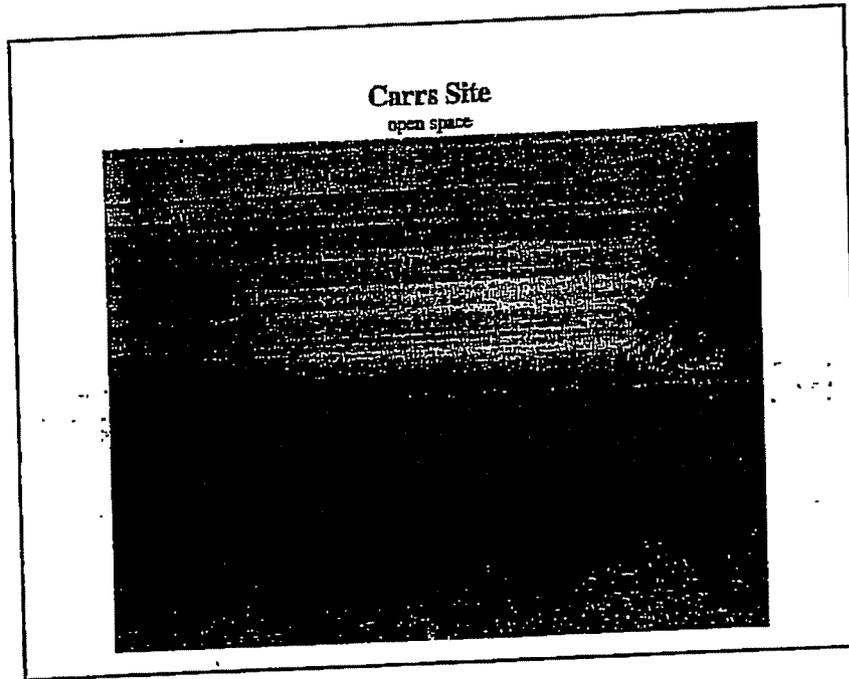
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## Appendix C

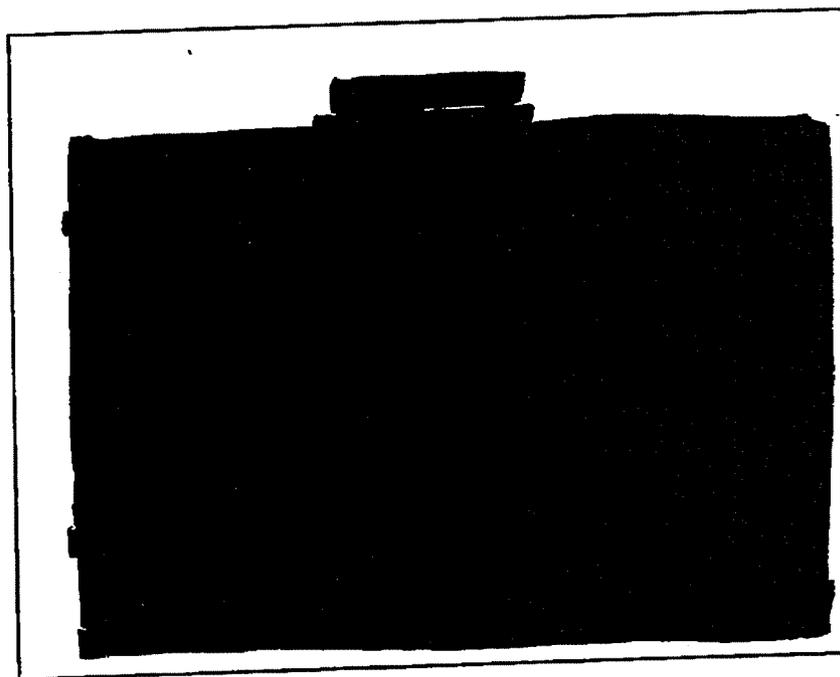
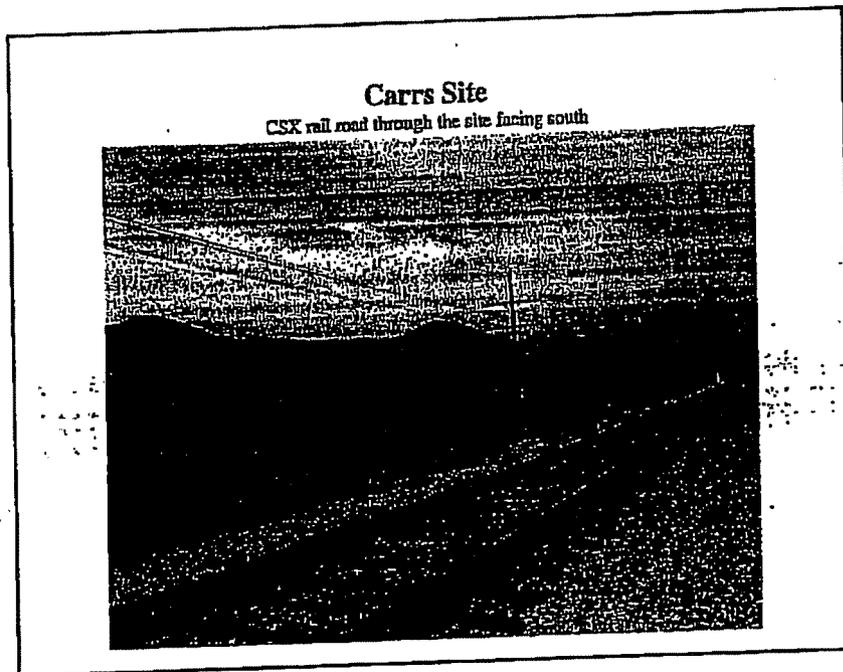
### Photographs of Visited Sites











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**Appendix D**

**List of AEP Documents Used in the Site Evaluations**

**List of AEP Documents Used in the Site Evaluations**

1. "Report on the AEP-Owned Sites of Interest for a New AEP-Owned Fossil Fuel-Fired Power Plant with Focus on the States of Indiana, Kentucky, West Virginia, Oklahoma, and Louisiana." by AEP Pro Serv, November 2002.
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
9. [REDACTED]
10. [REDACTED]
11. [REDACTED]
12. "Environmental Study for Carrs Site" by Energy Impact Associates, Inc., June 1978.
13. "1980 Archaeological Phase II Extensive Testing in the Proposed Carrs Site in Northern Lewis County, Kentucky" by Jack M. Schock and Terry L. Landford, May 1981.
14. "Environmental Study for St. Paul Site" by Energy Impact Associates, Inc., July 1978.
15. [REDACTED]
16. [REDACTED]

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**Appendix E**

**Paper by Sargent and Lundy, titled "Design Information for 1,000 to 1,200 MW (net) Integrated Gasification Combined Cycle Plant"**

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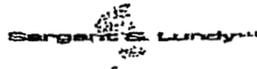
**Appendix F**

**Generic General Arrangement Plan, "Site Development, 1,000 to  
1,200 MW IGCC"**

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## Appendix G

### Site Layout Drawings

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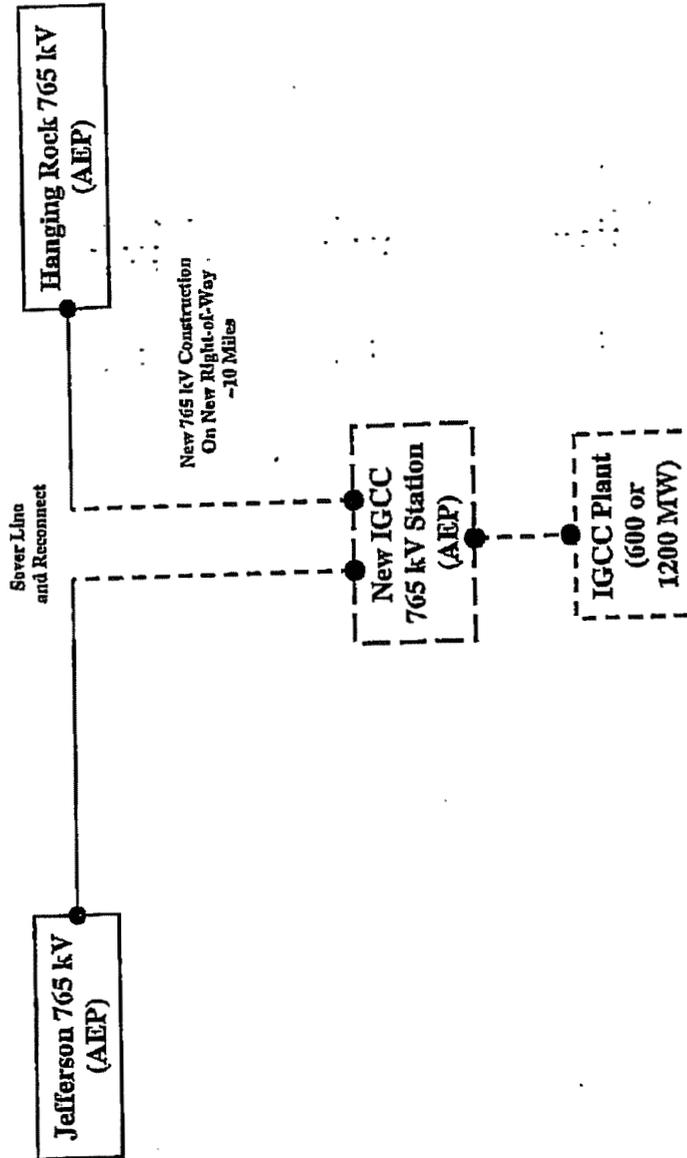
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## Appendix H

### Interconnection Concept Diagrams

# IGCC Plant Site Selection Study

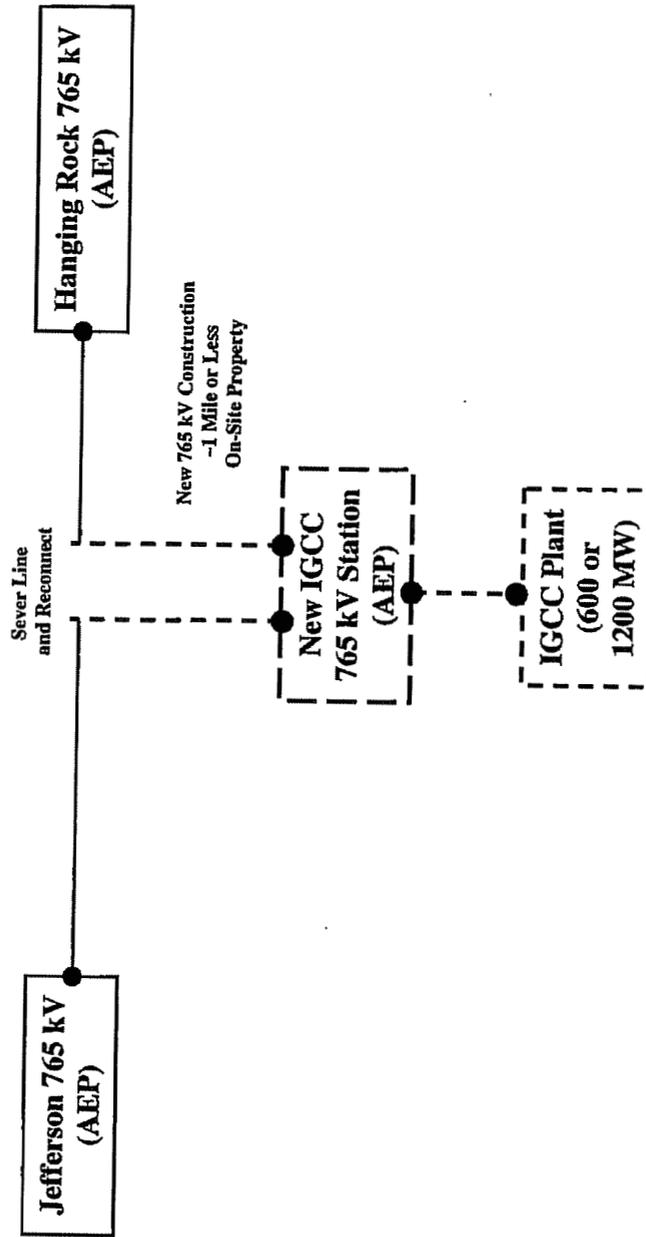
## St. Paul 765 kV Interconnection Concept\* - 600 or 1200 MW Plant



\*Minimum interconnection configuration illustrated. [REDACTED] proceed as planned for interconnection to the Hanging Rock station, a third outlet to the Marquis or Baker station could be a required element of a reliable interconnection plan.

# IGCC Plant Site Selection Study

Carrs 765 kV Interconnection Concept\* - 600 or 1200 MW Plant



\*Minimum interconnection configuration illustrated. [REDACTED] proceed as planned for interconnection to the Hanging Rock station, a third outlet to the Marquis or Baker station could be a required element of a reliable interconnection plan.

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## Appendix I

### Siting Rating Spreadsheet

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